

Before the Federal Communications Commission:

In the matter of (Docket RM-11829
Amending the Amateur Radio Rules to add a (
Tyro License Class, structuring part of the 70cm band, (
expanding coordinating committee responsibility, (
insuring amateur radio as the primary user of 430-440 MHz, (
adding scientific research to the explicit purpose of (
amateur radio and requiring governments to allow (
amateurs reasonable access to government land to build (
and maintain Amateur Radio Community Service (
(ARCS) radio systems. (

Reply Comments of Petitioner, Gary A. Hampton

(6) Introduction

6.1 While these Reply Comments revisit previously discussed issues, they now benefit from a largesse of comment. While the purpose of this Reply includes convincing the Commission to codify the ARCS Initiative (Initiative), it also tries to convince some of my ilk to change their opinion; thus, I apologetically addresses subjects upon which the Commission needs no lecture.

6.2 At the very core of this Initiative is stewardship: the public trust given to the Amateur Radio Service (Amateur, Amateur Radio, Service) and the behavior that trust spawns. Amateur Radio itself has always been a voluntary community service organization. This Initiative will benefit the Service, other such organizations, the public as a whole and amateur operators personally. In part, I have chosen comments written by amateurs exhibiting stewardship potential; operators wanting to do the right thing for their community; leaders that will be at the core of success, if this Initiative quickly becomes law. I want their help.

6.3 While there was opposition to several aspects of this Petition, an overwhelming issue was the lowered testing rigor of the *Tyro License*. The reasons the Initiative would reduce entry rigor:

- to pursue the *Basis and purpose* of Amateur Radio with greater fidelity,
- to improve the prospects for the continued health and growth of Amateur Radio using a consolidation of community service communications including hobby radio itself;
- this facilitates substantially increased public benefits provided by these services while,
- such benefits make Amateur Radio more visibly valuable to the public.

6.4 Using new technology and enhanced amateur management structures Amateur Radio can enter its second century with a refreshed vision. The carefully crafted entry level *Tyro License* pursues all the goals of Amateur Radio with very little risk. This Reply explains the strategy and why the risk is low.

6.5 Most oppositional comments seem rooted in a fear that the Initiative and its entry level license will (further) *debase* (“*dumb-down*”) Amateur Radio; a reference to Citizens Band Radio Service (CB or CBRS) was commonly affiliated. Seemingly associated with *debasing fear*, respondents proposed that the ARCS Initiative should be done elsewhere. The Personal Radio Services (PRS) were suggested... including, the General Mobile Radio Service (GMRS) and CBRS. Surprisingly, the Private Land Mobile Radio Services (PLMR) – often used by public benefit organizations – was little mentioned.

6.6 While this Reply gives reasons voluntary nonprofit community service communications should be done within Amateur Radio, it goes beyond that. It argues that for Amateur Radio to more fully pursue its public stewardship, its *Basis and purpose*, it must become more plebeian; the hierarchical social structure of all *hobby radio* should lie wholly within Amateur Radio. Only Amateur Radio has the mien required to foster the public's noncommercial radio needs. The people of Amateur Radio are the repository of radio's ethical art... an asset refined since before Maxwell.

6.7 Some respondents inculcate the Petition for suggesting an Amateur paradigm shift – “...an attempt to CB a portion of the amateur 70 CM band.” Perhaps they see a mirrored image forged to a subjective reflection. The converse *end-game* is the true image. Over time, the public value afforded by CB would be integrated into Amateur Radio where it could be nurtured by their ethic and connected to a grander vision. In other words, the Petition does not *dumb-down* ham radio – it lifts up CB radio by blending it into the amateur community.

6.8 Adding the Tyro License to incentive licensing is virtually risk-free... the pool of questions is small and can be static. Most of the risk areas are mitigated by the spectrum choice, the implemented technology and management structure proposed. The notion that new Tyro recruits can “*dumb-down*” Amateur Radio is as ludicrous as thinking a new freshman class diminishes collegiate imprimatur; the reputation of a college depends on what it can make of freshman. Remediation of an “*animal frat*

house” is high value indeed. No Extra Class will forget Ohm's law because every new Tyro is an old CB'er. They will not dumb us down; we will raise them up. And that is what we are asked to do.

6.9. A summary of the ARCS Initiative's major points

1. Adds the Tyro License... testing only basic operating rules and etiquette, no technical testing... License obtained using the existing VEC system.
2. Establishes a channelized Sub-band at 430-431MHz and 438.7-440MHz
3. 100, 12.5kHz spaced channels... using 2.5kHz deviation analogue FM for voice and data,
4. 21 simplex, 70 coordinated duplex repeater pairs, 8 itinerant duplex repeater pairs and 1 duplex digital control channel (Rendezvous Channel)
5. Coordinated repeaters only licensed to clubs... itinerant repeaters to clubs or individual licensees, Technician or higher.
6. Clubs elect state councils... state councils form a National Council of Amateur Radio Clubs.
7. State and National councils together approve repeater frequency coordination, open architecture radio system design (public domain technology only, no royalty, no secrets), establish test procedures for certifying radio compliance with the system architecture, as well as, safety and user control limitations.
8. ARCS radios will not transmit until an Amateur radio club programs the call-sign and club membership identifier into them. Clubs also certify radio alignment and architectural compliance.
9. The architecture has 16 million group collection identities. The reserved sets are assigned by the national or state councils. A subset is reserved for world-wide meaning (e.g., EMERGENCY), another reserved for nation-wide meaning, another reserved for state-wide meaning and another reserved for future use. A block of about 65 thousand (16 bits) is reserved for ad hoc user discretion and not coordinated.
10. The Initiative requires local, state and national governments to allow reasonable property access to construct and maintain ARCS repeater systems on government controlled property... including, mountain tops, highway medians, building tops, parks, etc. This can only be withheld when there is material interference with higher priority uses. While Amateurs should be mindful of aesthetics, government must compromise some subjective aesthetic constraints to accommodate this objective public value.
11. Negotiate Amateur primary user status in the United States on 430-440MHz .

(7) Identifying Some Valid Questions Spawnd by the Comments

7.0 This section identifies key questions that are answered by examining the goals of Amateur Radio and why Amateur Licensing has testing at all. Some comments question ARCS strategies... strategies

that are explained herein or have been adequately addressed in prior Comments. A few Comments address important related issues.

7.1 Howard Passel (KB4UY), seasoned enough to have his Advanced call-sign without vanity, sees issues as a teacher speaking for future generations:

I favor the new “Tyro” license. More than 60 years ago, the old Novice license was my entry into ham radio (I was 12 years old). The ability to go on the air was exciting and motivated me to continue in ham radio, while I learned the math in school to understand enough about electronics, operating procedures and wave propagation, so that I was able to upgrade my license. One important result of that early interest in electronics that the simple, easy entry into ham radio engendered was a career teaching (among other subjects) math, computer programming and philosophy of science. I believe that the “Tyro” license would attract more young people into ham radio lead at least some of them towards STEM careers. Please approve the new license class.

7.1.1 Mr. Passel's statement sets the stage for the Tyro License as a new entry level license intended to allow valuable new people into the amateur ranks and expose them to the incentive licensing process that encourages their advancement in the radio art. As Mr. Passel suggests, it is especially important for the future of Amateur Radio to recruit preadolescence young people (like him) when they begin to develop self-identity and their own uniqueness (Brown & Knowles, 2007, What every middle school teacher should know). No doubt, Mr. Passel is fully aware the pedagogic literature supports his thesis. His sentiment is the reason for the Initiative's deliberate inclusion of youth activities.

7.2 Joe Leikhim (K4SAT, PG1819647, WPXM352) reinforces Mr. Passel's thought and adds these comments:

As an amateur radio operator (K4SAT) I SUPPORT the concept of the Tyro Class License Petition. Providing a new avenue to bring interested folks into the Amateur radio service will foster growth in the service and will enable students new ways to participate in the developments of new technology. Tyro class operators can include volunteer communicators of all ages for disaster relief. I believe this concept could be workable in many areas of the country where amateur repeaters are scarce.

7.2.1 Mr. Leikhim points out the Tyro License would not only increase the size of amateur radio, it would broaden our spectrum of interest. Most importantly, it allows entry to more young people... people uncommon in amateur circles today. Perhaps some of the 4 million girl and boy scouts enrolled in typical years get their radio merit badge while becoming new recruits for amateur radio.

7.3 Mark D. Braunstein (WA4KFZ) addresses quite another issue; his Comment at paragraph 15:

While aspirational in its reach, the proposed distribution of repeaters along major highways, etc. requires access to existing infrastructure, donations by private corporations or landowners, and appropriate consideration of public land use. This cannot be mandated by the FCC since individual states have different criteria with regards to land use.

7.3.1 While Mr. Braunstein may assume the Petition promotes a taking of private property, he hits on an important piece of the ARCS Initiative: amateur access to public property. Part 97.15(b) already requires state and local government accommodation of amateur radio when it says they must:

“...reasonably accommodate such communications and must constitute the minimum practicable regulation to accomplish the state or local authority's legitimate purpose.” Already, this rule has forced many local governments to change their zoning law and allow amateur towers where they were previously restricted. It must do more.

7.3.2 The ARCS Initiative asks for a slight change in the wording of this Part. The change would require the standard already set by Part 97.15(b) to also be observed by Federal agencies. Moreover, the wording would be unambiguous regarding reasonable access to highway medians, mountain tops, public buildings, parks and other public property. This involves property already controlled or owned by the public and requires that Amateur Radio Community Service systems be given a high priority because of their public benefit.

7.3.3 Both amateur radio and government must be reasonable. Amateurs must do this safely, without materially damaging property or interfering with higher priority public use. Governments must learn to value the natural beauty of collinear dipoles, towers and solar panels. Governments must qualify amateurs for reasonable trespass, as well as, building and maintaining their own systems. This is not a taking of private property.

7.4 Denning Powell, a Honokaa, Hawaii CERT volunteer, retired business owner and regulatory/environmental engineer describes his experience with CERT and ham radio:

I endorse the concept of a “Tyro” class for ham operators. It would be useful, specifically, to our local Community Emergency Response Team (CERT) for community reconnaissance after a major damaging event like an earthquake or hurricane. We have tried GMRS radios, but they lack sufficient power for adequate coverage in our rural area here in Hawaii. Visitors from other CERTs in the area have demonstrated to us that ham radios are much more effective in our terrain/locale, but many of our CERT

members do not have the time to take the training course for full ham operator certification.

7.4.1 Mr. Powell's observation of more *adequate coverage* likely also stems from better systemic design, the sort of knowledge amateurs can contribute. Even though GMRS spectrum is similar to the ARCS Sub-band, deep technical ready-to-help knowledge is much less available. Not only does Mr. Powell point out CERT's exigent need for amateur community help, he immediately underscores the ever-present dearth of volunteer training time. This may be especially acute among young people rearing families... young people we need.

7.4.2 The important question Powell spawns is:

- Why should voluntary community service communications be done on Amateur Radio and not elsewhere? (Section 12)

7.5 The Rev. Dr. William K. A. Robison (K9EAR) of Springfield MO contributes this:

As an Extra Class Operator who teaches Technician Classes for CERT members I am opposed to this alteration of current standards and practices. It does not take a lot of effort to bring CERT members up to speed on current Radio practice and to get them to a point where they can pass the current tech. exam. No change is necessary to current practice.

7.5.1 Even prior to Powell's comments, several community service leaders had privately raised the training time dearth in our early planning sessions. After reading Robison's comment, I saw his QRZ biography claiming far more erudition than most. Asking for insight, on 10 May 2019, I wrote Robison and asked what fraction his Green County CERT teams have ham licenses and how his experience might contribute to the continuing health of amateur radio. No answer.

7.5.2 Thus, Rev. Dr. Robison's contribution is unexpectedly sciolistic. While his statement about the effort required to teach a technician class to willing students with adequate time is likely accurate, it is not particularly germane to key ARCS issues; thus, his comment fails to support his conclusion. His hooding ceremony and ordination/standing in a socially responsive denomination evidence more insight should be available. The ARCS Initiative needs people like him. Hopefully, he will rethink his position.

7.5.3 It seems likely Green County CERT has the same problem as Honokaa, Colorado, Iowa and Florida; most CERT members cannot prioritize their volunteer time to quickly achieve the Technician License. This is especially true when their only currently realized interest in Amateur Radio is to become trained in the radio art of communication. Consequently, just a

small fraction of CERT teams are amateur operators. The easy ones. Robison's comment does tangentially asks this question: What fraction of community service volunteers need to be amateur licensees? Ron Collins answers it.

7.6 Ronald T. Collins (KE0MJW), a CERT Program Manager, answers this “*what fraction*” question quickly:

When the instant situation is exigent, team-wide awareness beyond earshot is important; in emergencies, it is essential. Then, when anybody talks, the whole team needs to hear.

7.6.1 Collins is saying: sometimes, every volunteer needs a radio... not just the few that are the communication specialists on the team. This is likely true for all community service volunteer groups that work in separable teams. It is most certainly true if they deal with emergencies... and they do.

7.7 Robert Kinner (KE8VU) like Robison also defends the status quo:

I strongly oppose this proposal. It provides nothing not already available to those willing to make a commitment to amateur radio. It opens the floodgates to under-qualified and uncommitted persons, and is rife with the potential for abuse. Does the FCC really want to police another Citizens Band? Yet another thinly veiled attempt to increase the quantity of amateurs at the cost of quality and commitment.

7.7.1 While Kinner probably intends to defend Amateur Radio from abuse, this is what I hear him say: if the community service volunteers are good enough and committed enough people, ARCS can be done within amateur radio, as now structured, without change. His statement suggests an appropriate priority balance in the lives of volunteers donating limited time to help their community. If their training time is limited, it must be radio physics before red cross emergency first aid... or, a CERT volunteer must wait to use amateur radio. Their commitment to volunteerism is not enough proof of adequate personal commitment to a worthy cause. Further, no matter the radio system's technical protection to the public airwaves, only the current entry testing rigor will avoid abuse.

7.7.2 His ethic denies Amateur Radio to a community service volunteer until passing the current “entrance exam” testing both the qualifications and commitment required to avoid abusing the community owned spectrum.

7.7.3 Kinner does surface valid questions that must be answered:

- What constitutes adequate qualification and commitment for using Amateur Radio?
- Are quantity and quality antithetical or can Amateur Radio create quality from quantity?

And then there is the policing thing, also addressed herein:

- Is it because *Elmer* was missing that the *candy-man* was overwhelmed?
[*Elmer* and *candy-man* are euphemistic expressions. Amateurs call a ham radio mentor an *Elmer*. CB'ers call an FCC officer the *candy-man* because they are employed by the cryptic *Franklin Candy Company* (FCC).]

The Reply addresses all these issues.

7.8 Patrick Cartwright Jr. (WX2PAT & WQWS919) adds to Kinner's views:

*This proposal is a worse idea yet. This is nothing more than an attempt to “CB” a portion of the amateur 70 CM band . The Amateur Radio license requirements have been dummed down enough and made too easy. There is a reason that we require licenses and testing for Amateur Radio bands. There is no need (or room) for a channelized segment of that band. A better solution would be to open up group GMRS licenses for CERT groups and Radio Teams again like once before. **This proposal is a solution looking for a problem.** I urge the commission to not adopt this proposal but to look at the GMRS group license for these needs. [Emphasis added.]*

7.8.1. Mr. Cartwright's apparent hyperbole may also be driven by a regard for Amateur Radio. It moves beyond Kinner's notion that current testing rigor thwarts negative CB effects by alluding to actual damage: “*license requirements... made **too** easy.*” What damage has “*too easy*” caused? Does Cartwright mean *too easy* for the public good, the good of Amateur Radio... or, *too easy* for some unexpressed agenda? He offers neither explanation nor support for “*dummed down*” being causative of anything objective.

7.8.2 According to his “QRZ biography,” Mr. Cartwright is deeply steeped in community service activities. Thus, he must already know how amateur entry rigor limits the universal ability to use amateur radio in these public benefit activities. Perhaps in order to have two-way radio communication with his community service cohort, he also has a GMRS license. It seems unlikely his cohort's communication requires pecuniary content so, why would Cartwright want to keep them out of Amateur Radio? Yet, his opinion is quite consistent with others suggesting community service should go elsewhere.

7.8.3 Cartwright is also not alone in ignoring the problems faced by Amateur Radio. With his “*solution looking for a problem*” banality, Cartwright places this vital question on the list... a question addressed now and again later in this Reply:

- What are the major problems faced by Amateur Radio today?

7.8.4 Due to the average age of today's amateurs, we die at an alarming rate (see Bankston below). Coupled with our failure to adjust to cultural changes (see Reply at: 8.7 and Petition at: 3.53-3.67), Amateur Radio is becoming less significant to the public. Hobby radio moves to other services. Public benefit communications are forced to inferior services (see Comments of Longmont Amateur Radio Club, *et al.* at: Section 5). Saying Amateur Radio should be even

more exclusive... a “gated community,” with an even higher gate, begs these questions: Why? For what purpose?

7.8.5 Cartwright's statement also adds these important questions:

- What are the reasons for licenses and testing on Amateur Radio (Section: 9)?
- What is the reason for channelizing the ARCS Sub-band (Section: 13)?
- Is there room for the ARCS Sub-band on this part of 70cm (Section: 13)?
- Why should voluntary community service communications be done on Amateur Radio and not change the eligibility for GMRS license to accommodate non-family groups (Section 12)?

7.8.6 Hopefully, Cartwright will change his mind then recruit and train new Tyros in his community service cohort.

7.9 Myron Calhoun (W0PBV) and Richard Harkins (W0YGH) filed comments on the same day using these identical words describing an erroneous conclusion covered in Section 8:

Implementing a license class that requires no technical knowledge of radio does not support the purpose of Amateur Radio as outlined in CFR47-97.1.

7.10 Philip Martinez (KC3IPF) agrees with Calhoun and Harkins:

As a volunteer examiner, I've witnessed the frustration that some exam takers have expressed at having to know the 'excessive amount of technical material' to pass a technician exam.” “These same people also express little, if any, interest in experimenting in the radio arts which is the official reason for Part 97. This serves as a barrier to screen people who have little interest in the true intent of part 97 operations.

7.10.1 This Extra Class Volunteer Examiner from Pennsylvania shares an erroneous conclusions with Calhoun, Harkins and many other commenters that believe any pursuit of Amateur Radio **must** include radio physics. Perhaps the *exam takers* expressing frustration over excessive technical material to just enter Amateur Radio, may have a better grip on Amateur purpose than some current licensees.

7.11 The author of these written Comments released them into the public domain on 14 March 2019 and marked them as relating to the Petition; yet, thus far, they fail to appear on the Commission's site. Because his resolve for public pronouncement may have waned, his identity is protected using a freshly minted “CB handle” for his use: *Cupcake*. *Cupcake* is an Arizona Extra Class VE. His plainly worded comments are consistent with many,, but, he adds the colorful story of his reduced cogency path into hobby radio – herein, his becomes the Cupcake path into Amateur Radio:

I started out in CB radio in the 1980's and in my teen years I graduated to amateur radio having earned my license after reading the ARRL book and traveling several miles over a few hours on public transit into a not-so-good neighborhood in Queens, NYC, NY to sit for my first exam.

7.11.1 Yet, *Cupcake* inveighs the Tyro License thus:

Leave it to some liberal tool, such as yourself, to once again attempt lower the bar and hand that trophy out to everyone who just shows up. We are not entitled to an amateur license. The having to study and then sit for the VE session is almost a rite of passage.

7.11.1.1 [Actually, we are entitled to an amateur license. After all, the spectrum belongs to us. We have formed the Commission to manage this entitled use such that we share it equitably and to its best potential.]

7.11.2 For the several years *Cupcake* studied technical issues toward getting his first 1984 Amateur License, it is likely he fed his radio interest on the communications side, by talking to new friends on his CB radio. Except for his subjective need for an esteem differential between a CB License and any Amateur License, even *Cupcake* would see the irony in his Tyro disdain.

7.11.3 How different from his path is the Tyro License? Today, most of *Cupcake*'s Maricopa neighbors fail to see any significant esteem differential between CB and Amateur Radio. While his amateur friends may discern amateur *imprimatur*, most of his neighbors cannot.

7.11.4 Had *Cupcake* entered Amateur Radio with the Tyro License, he would have been part of the amateur community some years sooner. Seasoned hams would have helped him learn the technical material. Surely, they would have taken their teenage recruit through the dangerous part of town for his test.

7.11.5 Yes, the Tyro License is a trophy. Such a participation trophy does not diminish the value of the gold metal *Cupcake* finally earned. Adding the Tyro License adds many more people that will understand *Cupcake*'s value. While his Extra Class trophy symbolizes his amateur value, my family already sees his comic value: "*liberal tool*," indeed.

7.12 In my half-century in radio, I have known scores of people that took the *Cupcake* path. The Tyro License does replace *Cupcake* entry. It will shift CB popularity. "*Hobby radio*" will consolidate into Amateur Radio with the important public benefits discussed later.

7.13 Jeremy S. Taylor (K1JST) suggested that the choice of 430-431 and 438.75-440 MHz might cause a problem with the Millstone Research Radar. Radio Astronomy gets my attention; it is

important. On 26 March 2019, I send the proposed emission specifications to the contact at Millstone (reu haystack@haystack.mit.edu) suggesting, to the extent such emissions would be troubling to their activities, they comment on RM-11829. Their silence probably means they use other spectrum.

7.14 “Tyro” as the license name was criticized by Stiles (WF4LS) and several online sources. All names suggesting “new in the art” risk bringing some negative connotation... e.g., rookie, novice, initiate, apprentice, plebe, cadet, etc. I chose Tyro because it was less commonly used; it brings less “baggage” while still being quite accurate. Tyro will have a better chance of developing its own mystique without prior prejudice. Since “T” as a shorthand class designator is already used, “Y” would be obvious and unambiguous. Of course, my first choice is really *Padawan*... but, it is not good to get crosswise with the Jedi. Stiles also suggested a limited time license like the old Novice. I oppose this because I see no reason to expel even modestly interested hams. Life is long. Many will discover rekindled interest even after numerous Tyro renewals. Their children will graduate; they will retire; maybe they will even get rich.

7.15 Mary Brown (W0AAT) duplicates the complaints of several:

We already have a super easy entry level class, technician that 6 year old children have passed. We have no need to a channelized (CB???) Service plunked down in the middle of the 70cm band (and possibly right on top of the weak signal segment at 432 MHz that is used for moon bounce and weak signal work).

7.15.1 While six year old technicians are the youngest report yet, stories of preadolescence children passing amateur tests are vacuous. Even if true, the number of these mavens cannot be significant; the average age of a ham is still over 60. We need thousands of young people of only average intelligence.

7.15.2 Ms. Brown should not worry. The ARCS Sub-band intentionally straddles the conventional international weak signal portion of the 70cm band as well as the area reserved for satellites. The 9 MHz split leaves this band portion unencumbered.

7.15.3 Then there is channelization. Fatuous again. The 70cm band is already channelized in every state. It is so structured for the same reason CB is channelized. Channelization with standardized numbering is used in the ARCS Sub-band to remove frequency ambiguity and provide compact, universally understood terms for the

spectrum of intent. ARCS is about world-wide systemic interoperability. It only takes seven bits of information to identify the target frequency.

7.15.4 Further, compact frequency identifiers are important in digitally controlled multi-channel ad hoc trunking system as proposed for the ARCS Sub-band. These systems will bring A. K. Erlang's seminal work to amateur radio. Probably without realizing it, hams already use his ideas in their bank or in the security line at the airport. Notwithstanding the current welter, ad hoc trunking will bring amateur radio spectrum sharing on 70cm toward modernity. Channelization is not an icon for CB radio; it is a reasonable solution for many radio issues.

7.16 Edgar Mills (N4IYX) points to some things that might actually occupy a sliver of the ARCS Sub-band in a very few places:

...OSCAR, satellite, ATV, EME, remote control of repeaters and other uses too numerous to name.” “I am opposed to the tyro licensing in the 70 CM band and the channeling of those frequencies.

7.16.1 Being involved with frequency coordination for many years, I know Mr. Mills named most and added a few. The Sub-band straddles *OSCAR, satellite and EME* frequencies. It does have some interference potential with analog ATV channels 58 (426-432MHz) and 60 (438-444MHz), as well as, a few narrower channels used for control links. With the frequency agile equipment today, none of these are hard to move.

7.16.2 And they should move. The ARCS Sub-band would provide a world-wide interoperable mobile service. The others are fixed services. Such mobile services need widely available spectrum while fixed service only need locally available spectrum. Indifferently putting an ATV repeater on rare spectrum available world wide is an extravagance only available when spectrum demand is extremely low... like our 70cm band. 430-440MHz is world-wide Amateur spectrum. 420-430MHz and 440-450MHz are not. Put ATV there or on 33 cm (cable channels... 143, 144, 145).

7.16.3 Put the fixed stuff on local frequencies. Put world-wide interoperable mobile and international services – like ARCS, OSCAR, satellite and even EME – on international frequencies. There is plenty of room for both. With a little time and a new coordination, moving is easy.

7.17 David Bankston (WZ4SKY) President and CEO of Sparksfly Technologies, community service volunteer and Naples Florida survivor of Hurricane Irma contributes his insight:

I am in support of the new Tyro Class License. Here's why. Copied from the AARL Article posted 04/04/2018 – <http://www.arrl.org/news/more-than-30-000-new-ham-licensees-and-7-000-amateur-radio-exam-sessions-in-2017> “Despite the optimistic influx of 32,196 newcomers last year, the net growth of 5,349 – about 0.72% over December 2016 – reflects some 27,000 expired or canceled licenses in the FCC database over the past year. In making the case for entry-level license, the ARRL Board's Entry-level License Committee referred to “a large number of baby boomers (roughly born 1945-1965) [who] will soon be aging off the license rolls.” The committee predicted the Likelihood of a “significant decline in the number of hams, unless we take steps to reverse it. Baby Boomers – are aging off the rolls. Q Who's going to replace them? A Radio Silence if we don't change our thinking and do something new. I've discussed this proposal with many current HAMS. Many of them are instantly put off with it. They consider it watering down the requirements. 90% of them are Male Baby Boomers. They mostly like thing the way they are. It's a private boomer club with all their friends. Don't mess with my club. Well if we don't change it, it may go away in the long term. They TYRO Class would be a direct replacement for the NOVICE class. It existed before, why can't we bring it back? It seem like a logical step to bring new HAM candidates into the hobby. I suggest we work the TYRO proposal details into something that we can agree on as opposed to simply being against it without a better idea to submit in its place.

7.17.1 Mr. Bankston and the ARRL uncover the problem Mr. Cartwright failed to find. The notion that Amateur Radio is in good health is apparently a desirable delusion. Many believe it. In 1977, about two decades after CB moved to the 11 meter band, one person in 550 was a licensed amateur, while one person in 22 had a CB license. Clearly, there was substantial public interest in hobby radio; yet, overwhelmingly, they entered the hobby as CB'ers. In 1977 “Baby Boomers” were in their twenties and the average age of an amateur was 38. By 1999, Baby Boomers were enjoying career success with more time and money; then, amateur radio reached a population penetration of one in 406. Twenty years on, in 2019, the youngest Boomers are in their mid fifties ranging to the mid seventies and most hams are “Boomers.”

7.17.2 In the last score of years, amateurs have not kept pace with population growth; the current penetration is now down to one in 475. Even more alarming than the decline in population penetration, the average age of amateur licensees well exceeds 60 years. If you doubt this, just look around at any ham event. It is a stark fact: hams are in the “winter” of their lives.

7.13.3 Bankson asks: “who's going to replace them?” He discussed the ARCS Initiative with many of his local hams and reports: “... 90% of them are Male Baby Boomers. They mostly like things the way they are. It's a private boomer club with all their friends. Don't mess with my club.”

7.17.4 We are foolish to ignore both parts of Bankston's insight: 1) amateur radio will experience rapid decline in numbers (*Elmer* is dying) and, 2) it is part of the human condition for us to prefer our own kind... even to the exclusion of worthy others.

7.17.5 Point 1 is obvious and something even government cannot stop. Since we depend on *Elmer* to train the next generation, it is important to keep *Elmer* busy now... busy with a purpose that will transcend *Elmer's* life.

7.17.6 Point 2 is a struggle between our quick thinking process and the slower rational kind (Daniel Kahneman, 2011, Thinking, Fast and Slow). Respondent opinions potentially driven by Bankston's "**Boomer Club Bias**" (Section 11) must be subjected to rational processes. Public policy designers examine how they truly affect objective reality.

(8) Revisiting Amateur Radio Purpose (Rational Conclusions About Amateur Purpose)

8.1 Some amateurs seem to have a distorted understanding of Amateur Radio's purpose. Since the sinking of the Titanic in 1912, the highest priority purpose/intent for Amateur Radio has been expressed first, before all others, in Part 97.1 (a) thus:

“Recognition and enhancement of the value of this amateur service to the public as a voluntary noncommercial communications service, particularly with respect to providing emergency communications.”

8.2 Tinkering with technology is neither an exclusionary intent nor the primary purpose of Amateur Radio. Clearly, **it is one** of several aspirational goals... and a goal all amateurs should pursue within their own time, desire and ability constraints. While technical ability must restrict some amateur activity, it need not restrict all amateur activity. The Tyro License adequately balances these issues.

8.3 Next is a laconic exegesis of Amateur Radio purpose. It is followed by a section on the only legitimate license testing purpose; or, why and what is screened?

8.4 A synopsis of Part 97.1... Amateur Radio's "*Basis and purpose.*" Review both the rules and this synopsis for accuracy and fairness. Be skeptical.

8.5 Part 97.1 asserts:

1. communications and technical are separable skills,
2. nothing valuing technical over communications,

3. nothing preventing individual focus on one or the other (and we surely do that),
 4. that emergency **communication** skills are the most emphasized purpose,
 5. nothing requiring an entry level technical skill barrier,
 6. **expanding** the reservoir of trained operators as a whole, within amateur radio as a whole, the most plebeian entry accomplishes this goal,
 7. once new recruits are in, strive to improve both their technical and communications skills,
 8. nothing setting a schedule for new recruit advancement, they may remain at any class,
 9. promoting international goodwill.
- A) There is a reasonable implication that we are the stewards of Amateur purpose.
 - B) The purpose does **not** suggest FCC testing is to create a “gated community” keeping people out;
 - C) to say it another way, the “*Basis and purpose*” of Amateur Radio is getting people in... not keeping them out. [What delusion obscures such obvious intent?]
 - D) Our “*Basis and purpose*” makes temporary “dumbing down” – with **new recruits** – reasonable (quite like rearing children or teaching school).

8.6 Later, in the Rules, the Commission creates a foundation of **community** structure within Amateur Radio by establishing the **club station license**. The ARCS Initiative ameliorates this structure while investing more responsibility in the amateur community. This idea is expanded to a hierarchical structure of amateur radio clubs, fifty-one state councils of amateur clubs and the National Council of Amateur Radio Clubs (Section: 14.6).

8.7 Finally, cultural change affects Amateur radio. Cell phones have reduced the need for the kind of two-way radio communications where one person talks to one other person. So instead of one ham calling another on the drive home, they use a cell phone instead of the repeater. Computers attract technically inclined people to computer and electronics hobbies... maybe reducing the interest in radio. In fact, many hams are most interested in the technical part of radio that connects to a computer. This changes the attractiveness of ham radio for technocrats. This affects how narrowly we should interpret our Basis and purpose.

(9) Why Does the Commission Test At All?

(Rational Conclusions About Testing)

9.1. Today, there are two basic and legitimate reasons to test prospective amateur licensees:

1. **protection**: test communication and technical skills enough to be confident licensees know how to avoid interfering with other spectrum users, keep themselves/others/things safe and,
2. **incentives**: test their radio art growth and reward achievement.

Every amateur license test must balance these components:

- A) protection,
- B) incentives and,
- C) license privilege.

9.2 Unlike virtually all other radio services, amateur licensees are allowed to experiment, design and construct their own transmitters. Technical testing provides interference protection from technically unqualified persons. Further, amateurs have more freedom to move around the spectrum than all other services; hence, license classes with extensive frequency agility must comprehensively understand the associated risks. In short, more freedom demands more responsibility. [Not a new idea.]

9.3 Amateur license testing does intentionally create a hierarchical license structure. The Technician License allows use of spectrum with limited vulnerability. VHF and UHF propagation geographically limits problems. The Technician's spectrum is vast which isolates trouble more than would be the case on crowded HF bands. Moreover, since technical precision is more demanding in this spectrum, blunders often result in complete failure to transmit. Thus, Technician License testing can be less rigorous. And it is.

9.4 Because the General and Extra class licenses have more advanced privileges on even more vulnerable spectrum, testing is progressively rigorous. Since the testing equation is always a balance between protection, incentives and privilege, any future Technician License increasing access to the HF bands should require more rigor.

9.5 Over time, evolving technology reduced the need for technical expertise in radio services. Commercial-off-the-shelf (COTS) radio equipment became both affordable and reliable. Subsequently, technical licenses once required for the broadcast industry and commercial two-way radio were retired.

9.6 Today, most amateurs are “*appliance operators*”... using COTS equipment. Unlike early hams, almost nobody builds their transceivers, Morse “keyers,” voice processors, SWR meters. RITTY modems, phone patches, antenna tuners or even the antennas themselves. Largely, COTS technology is purchased already tested with performance guaranteed. Mistakes are harder.

9.7 Only a few hams actually develop technology at the component level. Some advance the radio art by designing and building complex systems of interconnected COTS devices. Since computer technology is now intimately integrated into radio communications, some amateurs contribute software advancing the radio art.

9.8 Yet, most hams advance the radio art on the communication side as trained operators. They refresh their training with structured activities and unstructured social conversation. Such practice makes them proficient at times when their expertise counts. Only as an eclectic whole, does Amateur Radio build the reservoir of trained operators, technicians and electronics experts.

(10) Stewardship and Amateur Radio (Ham Radio Is More Than a Hobby)

10.1 Clearly, Robert Kinner (quoted above) values Amateur Radio. He and I were first licensed in 1970; thus, we have first-hand memories of the early CB days. From his perspective, he sees entry rigor as required to protect what we have both valued for half a century. Once, I was of like mind. My experience with “*re-farming*” public safety directed my thinking to stewardship issues set in a bigger picture. One purpose of these Comments is to change the minds of Kinner and our ilk. Even those of us forming public policy.

10.2 For me, thoughts about *re-farming* radio spectrum began with the mentoring of a retired Chief of the Office of Plans and Policy at the FCC. As we began working on a Notice of Inquiry, my *gedankenexperiment* (*thought experiment*) began by considering the ownership and management of the electromagnetic spectrum. The spectrum is owned by all of us collectively. As we all know, in the United States the Federal Communications Commission has been given the primary stewardship role in spectrum management. They are in charge of its big public interest picture. They manage it. They may even sell licenses to use it. But, the title to the spectrum never transfers from all of us to any other entity. At no time in human history has their job been more important.

10.3 Less often realized, the Amateur Radio Service is among the Commission's most important partners in this public interest stewardship. Such amateur partnerships are true world-wide. Everywhere, ham radio is more than a hobby. No other radio service has more freedom. Perhaps none has more responsibility.

10.4 Continuing the *gedankenexperiment*. Again, this leads to the purpose of Amateur Radio and our stewardship role in pursuing that purpose. Virtually all worthwhile ventures have unavoidable risks. Our stewardship requires us to manage these risks by confronting and mitigating them... always, a balancing between risk and laudable goals.

10.5 Like the Commission, we are also public interest stewards. We must be mindful of the true nature of the public and act with measured strategies... attempting to neither over estimate nor under estimate both their need and abilities. The quintessence of this instant document is Amateur Radio's public interest stewardship. For good reasons, the Commission has depended on us to be altruistic stewards. Largely, we have been.

(11) What's so bad about CB radio?

(Human foibles affecting spectrum management and their relationship to the pervasive *debasing fear*...)

11.1 “*We do not describe the world we see, we see the world we can describe.*” The 17th-century philosopher, Rene’ Descartes frames a piece of the human condition that is both unchanged and instantly germane.

11.2 Despite substantial common interests, in Amateur circles, CB radio is often discussed with derisive overtones. Kinship between the two branches of hobby radio does not describe their relationship as well as festering rift. Likely, this all began when CB radio usurped the eleven meter amateur band. This set in motion the emotive process responsible for the counterfactual mind-set underpinning *debasing fear*. One can tell from the mood of the comments, emotional sentiment runs deep... probably as deep as self-worth.

11.3 Superficially, CB radio is quite like amateur radio... replete with “rag-chew,” slang-filled patter, “working skip” and QSL cards. Yet amateurs see CB as Oscar Wilde saw wannabes: “*Imitation is the sincerest form of flattery that mediocrity can pay to greatness.*” Just as the comments evidence, some amateurs abhor anything suggesting CB resemblance.

11.4 Arguably, CB radio has ignoble moments. They have flaunted the law. They were rude. They were crude. Sometimes, listening to them can be worse than a 75 meter rant. Yet, in sixty years, there is slim evidence CB radio (or, a 75 meter rant) ever cause great public harm. However, feckless community service radio can.

11.5 The current posture is rooted in the history of hobby radio. Amateur radio existed early – perhaps before the Civil War – long before the Radio Act of 1912 which officially established an Amateur Radio Service. In 1945, at the end of World War Two, the young FCC established Citizens

Band Radio. At the time, the Commission envisioned plebeian radio for the returning *vets*, with easy entry and easy use; but, they worried about equitable sharing if large numbers of users were allowed a freedom permitted Amateur Radio... specifically, conversation just for the sake of conversation. Such traffic was an amateur hallmark... and, ham radio was hobby radio. The regulation of hobby radio used by the multitude was uncharted anyplace on the planet; the risks unknown.

11.6 Arguably, the ARCS Initiative is what the Commission would have done had the technology been ready. Alas, instead of adding a plebeian amateur license they created a new service limiting the conversation type and transmit duration. Business use was allowed but hobby use forbidden. CB radio was ***not hobby radio***. At 460 MHz, there were Class A and Class B channels. Yet, for the next dozen years, the cost of UHF radios foiled the plebeian aspiration. CB use was rare. So, in 1958 the Commission reformed its ambition by moving CB radio to HF spectrum and less expensive radios. Class B Citizens Band became Class D and moved to eleven meters while, Class A remained on UHF to later become GMRS and FRS (where today, cheap radio are also plentiful).

11.7 The move worked. In only a few years, the Class D market penetration approached saturation. But human foibles were causing unforeseen problems in the uncharted regulatory billet. CB ethics retrogressed. Conversation just for the sake of conversation was common. They talked skip. They ran excessive power and failed to identify their stations. All the Commission's prohibitions notwithstanding, CB became ***hobby radio***. And, hobby radio had ***our kind*** and ***their kind***.

11.8 In 1954, William Golding published Lord of the Flies. The novel is implicative of what happens to inchoative humans isolated from mature community. After all, mature communities have benefited from an asymptotic evolution toward ideals. While perhaps never perfected by a process punctuated by remedial failure, nevertheless, community ethics do mature. The novel describes marooned youngsters struggling with community values. Due to their modest maturity, the ethical comportment of the novel's children was limited. Their isolation removed any adult supervision... supervision once enforcing behavioral norms. Soon, primal instincts overwhelmed them. They were rude. They were crude. They ranted and flaunted conventions. In short, their ethics retrogressed.

11.9 Lord of the Flies warns that removing mature ethic is dangerous to human community. It is a special kind of isolation. Absent a mature ethical legacy humans are left with only the primal instincts

they needed to survive the primitive world. Remedial community keeps ***our kind*** from becoming ***their kind***.

11.10 Golding must have realized that humans are never purely altruistic nor are they purely ignoble. At every moment, they are a mix of both. Survival depends on both. The mix-ratio largely depends on experience and circumstance. The challenge is developing community structures keeping ***our kind*** from becoming ***their kind*** and even inspiring ***their kind*** to become ***our kind***.

11.11 In 1958, CB radio was marooned. Like the puerile castaways of Golding's novel, the new branch of hobby radio had no mature guidance. A century of refining social technical and ethical radio art remained with the hams. CB got eleven meters but, much of their radio hobby was hollow. “*Elmer*” was missing so the “*candy-man*” was overwhelmed.

11.12 Ignoble CB behavior became emblematic for hams. Hams thought: *Surely, everyone must see them as inept pretenders*. That was not the case. To the public, *hobby radio* all looked similar. By 1977, most of the public knew a score of CB'ers for every ham. CB was fresh and in the movies. Some of our neighbors might even wonder: *Was ham radio replaced?*.

11.13 For hams, the public indifference was maddening. When they told their new neighbor they were hams only to have the neighbor ask: *Is that like CB radio?* What is the answer? Hams could not simply say: CB'ers are rookie hams just being trained... they are our freshman class. They were trapped into looking for ways to distinguish themselves from their rowdy, reckless, ribald but very visible hobby radio rival.

11.14 Now things get personal. Being a vetted licensed Amateur is important to hams. A perceived denigration of the licenses can solicit defensive reactions like these:

“...to once again attempt lower the bar and hand that trophy out to everyone who just shows up. We are not entitled to an amateur license. The having to study and then sit for the VE session is almost a rite of passage.”

“Does the FCC really want to police another Citizens Band? Yet another thinly veiled attempt to increase the quantity of amateurs at the cost of quality and commitment.”

“The Amateur Radio license requirements have been dummed down enough and made too easy. There is a reason that we require licenses and testing for Amateur Radio bands.”

11.15 Objectively, including a ham license free in every new box of breakfast cereal would not steal a single radio art skill from any amateur. So the personal value lost is not the skills learned or the public service performed or past fun. It is something else.

11.16 Frederick L. Stiles (WF4LS – David Bankston's Ft. Myers repeater neighbor) also talks about loss:

Most hams will not see any public advantage to offset their loss in this proposal. Worse, though, this new service will carry the imprimatur of Amateur Radio, which has historically suggested a degree of competence. This will have the effect of diluting the value of the Amateur Radio “brand”.

11.17 While the loss to which Larry points is ambiguous, loss of spectrum cannot be the answer. The ARCS Sub-band would remain amateur spectrum (actually, the only part of amateur spectrum available to all licensees when the Tyros are included). Moreover, the spectrum chosen is virtually vacant, Using it cannot be the loss. Larry's “*degree of competence*” issue suggests the loss pointed to is: A reduction in amateur *imprimatur* (*explicit approval of good standards*) due to the addition of a new license class which is less vetted than the existing amateur license classes. That must be it.

11.18 So, does the public reduce amateur *imprimatur*? For the public to reduce the explicit approval of Amateur radio the following must be true: The Tyro License will diminish Amateur Radio's value to the public because it reduces the public benefits Amateur Radio contributes. While the Tyro License might mean the average ham is less technically proficient than now, the public would not even notice. The competence they might notice is their local CERT, Red Cross, Boy Scouts, Habitat for Humanity volunteers all using Amateur Radio for their community service activities. The public will not know how much radio physics is required to achieve their public benefit goals.

11.19 So, if the public is not driving the entry rigor demand, who is? Larry suggests most hams (well, maybe some hams). Then, the question becomes: how to square that “*keep them out*” demand with their stewardship roll? Stewardship asks: Why set the competence standard beyond that needed to meet the public goals and still protect the spectrum? The “*no Tyro*” argument falls apart because spectrum loss, public benefit loss, amateur brand loss, amateur competence loss... they all were never the real issue among the naysayers.

11.20 Imprimatur, dumb-down and do-it-elsewhere are disguises for something they cannot say out loud. These are examples of counterfactual mind-sets subjectively obscuring objective reality. At their core, some hams find self-worth in being part of an **exclusive** club. Easy membership means less **exclusive**. The fear is: **less exclusive** means **I am less valuable**. Couple that with “*I like people that are like me*” and you get David Bankston's *Boomer Club*.

11.21 These very human foibles are entangled in Descartes' dichotomy between delusion and knowledge, between objective and subjective reality. This is the birthplace of *debasing fear* and *Boomer Bias*. Good public policy penetrates deeper than a demand for more *isolation* or, putting *their kind* someplace other than my island. In the end, we must all find an answer to: What **kind** is **their kind**?

11.22 My answer: These potential Tyros are us... us without the benefit of Amateur Radio's ethical legacy. Scorn and sequestration is not what our stewardship legacy demands. Let them in. Let anybody in that has interest in any of the goals of Amateur *Basis and purpose*. We are called to help them grow. We can help them. We have helped them. When *Elmer* returns, the *candy-man* can work another venue. And we will find transcendent self-worth in our contributions to the public good.

(12) Why Amateur Radio and not GMRS?

12.1 With pellucid attention to Part 97.115 (a)(5), the proposed communications cannot be **reasonably** furnished in any other radio service. Forcing it elsewhere, as we now do, **unreasonably** thwarts the public interest. For their own reasons, several respondents suggested GMRS. This section explains why GMRS is not reasonable. Only Amateur Radio can reasonably do this. The single most important reason is Amateur Radio's people legacy. That could be reason enough but, some supporting ideas are found below.

12.2 Community service volunteers work in teams of people that can respond in that moment to the instant problem. The people showing up need communication with everyone that arrives. Their membership in the Red Cross, CERT, the Salvation Army, the Boy Scouts or the church mission volunteer group is not as important as the fact they are all there, right now. There to help. Their activities need coordination. Their radios need to quickly work together. When some radios are on CB and others on GMRS, FRS, PLMRS or Amateur Radio... well, the problem is obvious. Even though

they are from diverse organizations, their radio need to work together, in that moment. So, in order to have universal compatibility, what service should all the groups choose?

12.3 Their primary need is clear, reliable, dependable, small low cost radios on spectrum with little noise and other kinds of interference (especially ionospheric) with a potential communication range of a few hundred feet to a few dozen miles. This suggests the high end of VHF or UHF using both repeaters and simplex.. The radios should be able to put random (ad hoc) groups together on a common channel in just a few seconds. This narrows the choice. Such requirements realistically exclude all but PLMR, GMRS and Amateur Radio.

12.4 While not always required, it can be crucial for these ad hoc volunteer groups to travel widely, helping where help is needed. Often this means remote areas. Sometimes the need is near the Canadian boarder, in Haiti or or even Africa. After all, they are goodwill ambassadors.

12.5 They will also use these radio for other things – talking with your friend and family, a fishing trip, getting help on the highway. These are real and practical need. This use makes people familiar with radio use and improves their communication skill.

12.6 There is virtually no chance of coordinating spectrum to meet these requirements on any service other than Amateur Radio. GMRS comes close but is virtually unavailable outside of North America. Even in the United Sates, there are restriction near the Canadian boarder.

12.7 Moreover, GMRS is needed by family businesses (farms, lawn care, housekeeping, etc,) for pecuniary communication using low cost radio systems. Loading eight GMRS repeater channels with hobby radio users and community service volunteers will result in unnecessary future reallocation demands. Amateur entry barrier coupled with lower cost radios and increased needs are already driving hobby and community service to GMRS (see Comments of Longmont Amateur Radio Club, at 5.2).

12.8 Expanding from above, the most important reason for choosing Amateur Radio is its infrastructure. Yes, there are already hundreds maybe thousands of existing systems that could be moved to the ARCS Sub-band. But, the most important infrastructure in favor of Amateur Radio is its people. As Denning Powell suggests at Section 7.2, Hams already know how to solve the problems of managing such radio systems.

12.9 Trunking and its group collection architecture should be designed with features tailored for community service. This can happen in the Amateur community. Such an effort has no realistic path to success in GMRS spectrum. If this is done in Amateur Radio on the ARCS Sub-band, there is a world-wide market for makers of the new equipment... probably, triple the potential of the GMRS prospect. Amateur Radio can build repeaters in Interstate Highway medians nation-wide. Their now quiet repeater systems already cover a large fraction of our major highways. Who else could even consider such a task?

12.10 Amateurs know how to train volunteers. They can and will volunteer their help. No other service is ready for such an Initiative. Amateur Radio is. And the public interest need them.

(13) Defending the Systemic Architecture and Spectrum Choice

13.1 Architectural Goals:

1. Small low-cost reliable robust easy-to-use radios... 3 Watt hand-held < \$50.
2. radio systems use a spectrum allocation available world-wide.
3. Proven robust easy-to-manufacture, RF modulation allowing 12.5 kHz channel spacing
4. spectrum provides excellent local coverage reliable between 3 Watt hand-held radio up to a kilometer.
5. Spectrum has little electrical noise or ionospheric propagation interference
6. spectrum propagates well through vegetation rain and buildings
7. spectrum allows small portable antennas
8. spectrum allocation supports voice and data transmissions at 2400 baud or more.
9. Spectrum allocation allows voice and data repeaters able to extend the local 3 Watt outdoor range to 20 km from a 30m tower.
10. Repeater systems work the same everywhere
11. at least 50 repeater pairs and 20 simplex channels available.
12. Smart repeater systems identify themselves with their status information to requesting mobiles using a world-wide protocol.
13. Smart repeater systems can gather selected call-groups of mobile at the request of a mobile.
14. Millions of call-groups are possible... some high-priority groups are understood world-wide... thousands can be assigned for state-wide use... thousands are available for ad hoc groups.
15. Users can quickly select a plurality of group memberships... yet, emergency calls are always heard.
16. System architecture, control protocol and data transmission protocol is in the public domain, available to anyone without secrecy agreements or royalty payments. Anyone can manufacture radios using this architecture.

17. Overlapping coverage systems automatically select best repeater for a call (ad hoc trunking)
18. Small lightweight portable repeaters using small duplexers... all but antenna system in 3U rack.
19. Single dedicated system control channel, world-wide. Mobiles know where to look for status.
20. Choose spectrum that minimizes impact on installed user base

13.2 These are the goals that drove the choice to the proposed 70cm ARCS Sub-band. No other radio service can achieve the above goals

13.3 The ARCS Initiative proposes structural change to the supervision and use of only a small – little used – slice of amateur 70cm spectrum. The proposal lowers vilification risk, improves spectrum capacity, maximizes diverse group sharing while assuring the potential for world-wide interoperability. The Initiative not only prescribes the technical architecture to be implemented, it outlines the structure managing both attainment and maintenance. Such structural advances facilitate communications that were always consistent with Amateur Radio's *Basis and purpose* while mitigating the risks.

13.4 Tyros are not isolated. They get their license by seeking out Volunteer Examiners attached to an amateur club. When the new Tyro Licensee gets an ARCS Sub-band radio, they join a club to get it programmed for use on the nation-wide repeater network. They become part of this community with new friends that have a published ethic. Club membership offers regular opportunity to learn and advance in the radio art. Because of the nation-wide repeater infrastructure, interest in CB radio is likely to migrate from eleven meters to the ARCS Sub-band. This will be especially true of highway travelers.

13.5 The bifurcation between the Amateur Radio Service and Personal Radio Service becomes even clearer: **Amateur Radio is for any voluntary noncommercial communications traffic that otherwise comports with Amateur rules.** Conversely, on PRS, pecuniary commercial traffic is allowed. With the entry level bias toward PRS reduced, hobby radio interests now have nearly equal access to either service. With no material risk to the public or either service, the Commission allows individuals to make their own choices. Now, Amateur Radio is an easier choice... a choice with more public benefit, more personal benefit and more Amateur Radio benefit. And, less enforcement risk for the Commission.

13.6 The success of the ARCS Initiative and its Tyro License relies on available technology reducing the detrimental effects of anonymity. ARCS Sub-band radios would use automatic digital identification by radios not able to transmit until programmed with a call-sign.

13.7 Further, all coordinated repeaters would be licensed by amateur radio clubs and membership in any one club (*home-club*) would be a requisite for using all the coordinated repeaters, nation-wide. The Sub-band protocol would include the digital transmission of *home-club* information. *Home-club* information would also certify:

- this radio was tested and passes the certification procedure prescribed by the National Council of Amateur Radio Clubs.

13.8 Tyros must seek out and join the amateur community: they must join at least one of 12 thousand clubs. These amateur clubs are responsible for mentoring the new recruits. Being in amateur club leadership, I know this happens now. It has been happening for years. Amateur Radio clubs formed around the a Club Station License was a profound spectrum management idea,

13.9 Any claim there is no room for the ARCS Sub-band is specious. The ARCS Sub-band uses virtually unoccupied spectrum... unoccupied nation-wide. Not a single state coordinating committee or even a single amateur licensee submitted any evidence the selected sub-band could not be coordinated for ARCS use. As an officer in the Colorado Council responsible for state-wide repeater coordination, I know of no reason the ARCS Sub-band could not be accommodated with only minimal issues. While the whole of Colorado is less densely populated than some regions, that is not quite the case on the Front Range. Much of our population is concentrated there. In regions near Denver, every repeater pair in our band-plan – for both 200cm and 70cm – is **coordinated**, with a projected five year waiting list.

13.10 Notice, I said the channels are coordinated, which is not to be conflated with occupied with traffic, for much silence abounds. Nationally, amateur radio is still using “old school” channel sharing... the kind of sharing that other service have replaced. The ARCS Initiative will bring “*re-farming*” using pluralistic trunking techniques to Amateur Radio. This technology has been quite successful for public safety and other PLMR services. It can triple the capacity of spectrum compared to “old-school” channel reservation strategies. This is a fundamental reason for reserving one of the 100 Sub-band channels for system control (Rendezvous Channel @ 430.5/439.5MHz). If ARCS had

no other benefit, that alone would be reason enough for this very limited Sub-band set aside experiment. An experiment long overdue in Amateur Radio.

13.11 The Tyro license would be the beginning of an expanded process... a process with good balance between protection, incentive and privilege. It would restrict both frequency agility and the ability to experiment, design and construct radio transmitters. It becomes the entry level membership in amateur community... the community expected to encourage and facilitate Tyro advancement in the radio art.

13.12 The ARCS Initiative allows today's advanced technology together with certification from the technically qualified amateurs to allow Tyro licensees to learn communication skills before they fully acquire more advanced technical skills... with little risk. Unlike higher class licenses, Tyro Licenses would not be allowed to make risky transmitter adjustments.

13.13 Thus, the Initiative is not, as Kinner said above, a *"thinly veiled attempt to increase the quantity of amateurs."* No veil is intended. The Initiative is a transparent attempt to increase the quantity of amateurs with the expectation that Kinner and the amateur community will do what Part 97.1 requires: nurture these new recruits toward our *"quality and commitment"* expectations.

13.14 Why would Tyros not be capable of such achievement? Why would people giving away their time and talent to rescue community victims – the people of Cartwright's community service cohort – not be able to contribute to the reservoir of trained emergency radio operators. Do they ever need to become technical experts to contribute to the whole of Amateur Radio?

13.15 Yet, a few of them will, if we let them in the club. Like other Services, the Tyro License focus is on communication skills. Unlike other Services, an amateur Tyro Licensee has a path to advancement... albeit through Ohm's Law, Smith Charts and Maxwell's Equations. Contrary to Erroneous Assumption 9, such a path through the radio art is entirely consistent with Part 97.1.

13.16 ARCS offers dramatic growth opportunity for Amateur Radio. Importantly, it makes Amateur Radio much more visible; the significance of Amateur Radio will be generally recognized and the public will view our use of the public's resource as a wise investment. ARCS helps Amateur Radio pursue renewed purpose into a *second century paradigm* with a new vision.

13.17 Transcending the trivial, what the public will notice is volunteers from the Red Cross, CERT, Salvation Army and their local church mission groups, all using repeaters built and maintained by Amateur Radio Clubs... using them to clean up after a Salt River flood... or, on the trip to help Ft. Myers with Hurricane Irma... or, the trip too Mozambique and the Zambezi flood (which is certain to promote international goodwill).

13.18 The volunteers notice the radios worked everywhere they went. Everybody could talk to everybody. They could also select only their own group. Push the emergency button and everybody within repeater range hears a call for help. ARCS does that... and, the Tyro License facilitates the “everybody part.”

13.19 Yes, just like GMRS, nobody needed to know radio physics to use them. But unlike GMRS, somebody did know radio physics. The advanced amateurs among them were responsible for that part and more. They trained the Tyros, built the radio systems and kept them all working. Others built the door frames, paddled the canoes, cooked the food and stopped the bleeding. It was a team effort where everybody did not need to know everything... only the part upon which the team depended. They were all stewards of public interest priorities, not just amateur radio priorities.

13.20 The ARCS Initiative is intended for teams working together for the common good. It allows ad hoc teams to reorganize in seconds. The Red Cross volunteers from Michigan can team up with the Texas Civil Air Patrol for a few hours of reconnaissance. After the reconnaissance, the Canadian church mission group joins the Red Cross volunteers in their search-and-rescue mission. Clearly, this scenario pursues the Basis and purpose of Amateur Radio. And only Amateur Radio can make such a thing happen.

13.21 Comments raised the issue of “non-standard” ARCS Sub-band repeater split. For some never explained reason, there seems to be an assumption the 5 MHz repeater transmit/receive split should be a standard. This is ironic. Unlike the precedent setting commercial radio model, this “ham **standard**” failed to establish which of the duplex pair was input and which was output... nation-wide. Public safety and business radio always knew... but, not the hams. As the amateur repeater revolution started, we knew the superannuated commercial radios we were converting for 70cm would work with the

5MHz split. Even then, many would barely do “talk-around” with that split. Today, things are different. This is the best time we have left to improve the standard.

13.22 The ARCS Initiative goal is a world-wide Sub-band available to all of amateur radio in all three Regions of the world. It is a mobile service. The mobiles using this Sub-band – together with their portable repeaters -- will travel world-wide to “*enhance international good will*” by helping with flood relief in Mozambique, hurricane cleanup in Haiti and tsunami reconstruction in Indonesia. As such, it takes precedence over fixed services because it needs world-wide interoperability. The frequencies used for a local repeater control link or an amateur television exchange are not so constrained; thus, they have greater frequency freedom. Their need is only local, not needing interoperability.

13.23 Amateur satellite frequencies, moon-bounce, tropospheric, aurora and meteor scatter frequencies have a similar international requirement. Such issues suggest that portion of 70cm between 430 and 440MHz. This is the only 70cm amateur spectrum available world-wide.

13.24 With repeaters, the wider the input/output spacing the more effective the duplexers: lower cost, smaller, more forgiving pass-bands etc. If one restricts the spectrum used for repeaters to only two of the ten MHz available, avoid “line A” problems, protect the existing intentional simplex activity, avoid the Region One ISM band and keep the split small enough for modern mobile transmitters to achieve repeater inputs as well as “talk-around,” the ARCS Sub-band plan is the result.

13.25 The portion of 70cm from 420MHz to 430MHz and 440 to 450MHz is not available world-wide. There are further restrictions for a variety of reasons. These are good pieces of spectrum for sharing with other services (e.g., radio location radar, commercial and government land mobile, wind profiling radar). This is the 20 MHz of 70cm that amateurs should use for local fixed communication. Yet, virtually all 70cm repeaters (mobile relays) are located in 440 to 450MHz because, back in the day, that was the easy conversion for retired commercial radios. It is a new day. Now is the time for changing standards.

13.26 The ARCS Initiative asks the Commission to negotiate all of 430-440MHz as that portion of our 70cm band in which Amateur Radio Service is the primary user. Failing that, at least the ARCS Sub-band should become an amateur primary band. Since this is important for international

communication and mobile interoperability, it is in the interest of the Service to focus its mobile and international fixed activity here. Other portions of the band can be better coordinated with other services when the amateur activity is at fixed locations. In this way, other services will be less affected by transient mobile amateur activity. For most other services (e.g., wind profiling radar, or radar bouncing signals off of Mercury, Pave PAWS), their needs are met by almost any wavelength near this band. Thus, they should welcome the protection this plan offers.

13.27 Using this 2 ¼ MHz in the way proposed by the ARCS Initiative, allows this Sub-band to carry as much traffic as the entire 440-450MHz portion of the band does using current technology. This is possible because each channel is half as wide and the proposed trunking technology usually triples capacity. These “re-farming” techniques are well proven in both public safety and the Specialized Mobile Radio Service. Over time, repeaters occupying 440-450MHz will move to the ARCS Sub-band making plenty of room for fixed links and television. Since this band-plan leaves 8MHz between the two slices, DMR and other types of mobile systems can still be supported on the old 5MHz split. Finally, since almost all modern equipment is frequency agile, this migration should be almost free.

13.28 While there were claims the proposed Sub-band spectrum is densely used in some parts of the country, not a single Comment discussed measured busy-hour occupancy. Rather, occupancy and channel assignment are conflated while, other confusion is common.

(14) ARCS Sub-band Regulatory Detail

14.1 The goals of the ARCS Sub-band are:

14.1.1 To pursue the radio arts by providing ubiquitous interoperable nation-wide (with world-wide aspiration) mobile radio service for plebeian nonprofit communications especially designed for egalitarian use by diverse groups of volunteers doing community service as well as simply pursuing the radio hobby.

14.1.2 To contribute to the radio arts both spectrum efficacy and spectrum conservation using Amateur contributed systems and technology. Implemented technology must be open architecture meaning: the technology is in the public domain and is publicly documented; use of the technology does not require the payment of royalties; the manufacture of equipment can be done by anyone skilled in the art without entering into a non-disclosure agreement for the systemic requirements as prescribed by the National Council of Amateur Radio Clubs. Herein, this is the ARCS System Architecture.

14.1.3 To pursue the radio arts by substantially increasing the number of trained operators within Amateur Radio.

14.2 The ARCS Sub-band consists of about 2 ¼ MHz of spectrum in the 70cm amateur band. The Sub-band is split into two parts: the upper slice is bounded by 438.725-440.000 MHz., the lower slice by 430.0 MHz-431.0 MHz.

14.2.1 The Sub-band is intended to provide two-way radio communications among mobiles. Such communications can be systemically supported: fixed or mobile radio devices can provide system status, direct traffic toward selected channels, repeat mobile traffic and provide other features assisting mobile communication.

14.2.2 Transmitters using this Sub-band may not exceed 30 Watts as measured at the transmitter output terminal.

14.2.2 *Systems* in this part can refer to any radio providing systemic service to mobiles. Repeaters are *systems* but *systems* are not always repeaters.

14.3 Amateur Radio itself will manage most of the architectural detail on this Sub-band including the systemic technical design and compliance certification as well as coordinating some system activities. The management structure is thus:

14.4 Coordinated repeaters will be licensed only to amateur radio clubs as provided in the rules.

14.5 State Council of Amateur Radio Clubs: Participating amateur radio clubs in each state will form a state-wide council that will manage the assignment of coordinated repeater frequencies within its state and along its borders.

14.5.1 The District of Columbia will form a like council that will also include and represent amateur clubs from geographic location where the FCC manages the radio spectrum but are not within one of the fifty states; herein, the use of *state* includes this District.

14.5.2 These fifty-one (51) state councils will be elected using democratic processes.

14.5.3 Further, each State Council will annually select a single delegate representing that state before the National Council of Amateur Radio Clubs.

14.5.4 These 51 delegates will form and maintain the National Council of Amateur Radio Clubs.

14.6 National Council of Amateur Radio Clubs: As the voting members of the National Council, the state delegates will use democratic processes to write and maintain bylaws describing their operational procedures.

14.6.1 Such bylaws will provide a nine *seat* Board of Directors consisting of three sets of three *seats*, each set with a rotating *commutation schedule* not allowing any set to exceed three years before *commutation* while, each year one set will commute. This insures that 1/3 of the Board is replace each year while maintaining an experience base. Empty Board *seats* are always filled by random selection from the current pool of elected delegates whether the *seat* was vacated by commutation or retirement otherwise.

14.6.2 The National Council will manage the development of the technical systemic architecture used on the ARCS Sub-band pursuant to the Commission's rules: the ARCS System Architecture.

14.6.3 The National Council will publish the procedures used by participating amateur radio clubs to both certify the performance of ARCS radios and program them for use on coordinated repeaters.

14.6.3.1 ARCS System Architecture will prescribe radios certified to use coordinated repeaters may not transmit on coordinated channels until they have been programmed with the licensee's call sign and the identifier for the certifying club.

14.6.3.2 ARCS System Architecture radios will digitally identify using their programmed call sign at the start of each transmission. This does not replace other required identification requirements.

14.6.4 The National Council will publish ethical guidelines for using this Sub-band.

14.6.5 The National Council will assist state Councils with coordination guidelines and regional coordination issues.

14.7 The Sub-band is channelized into 100 numbered channels. Twenty-one (21) channels are simplex channels and seventy-nine (79) are duplex pairs associated with radio *systems*... usually repeater systems.

14.8 All the channels are centered on 12.5 kHz spacing. The modulation is analog FM. The deviation is limited to plus/minus 2.5 kHz. The modulating frequency is limited to less than 3 kHz.

14.9 While these channels are generally available to all Amateur license classes, the output frequencies of coordinated repeaters are only available to the repeater licensee.

14.10 Ninety-nine (99) channels are **traffic-channels**; they may carry voice or data. While *traffic-channel* priority is voice, they may carry digital data traffic; it is even encouraged. When voice is transmitted, a 6dB/octave preemphasis is used together with sub-audible tone "D" (Section: 14.15). When data are transmitted, no sub-audible tone is transmitted. The emission designators for the *traffic-channels* are: 11k0F2D, 11k0G2D, 11k0F3E, 11k0G3E, 11k0F9W, 11k0G9W.

14.11 One duplex channel is dedicated to *system* control. Only data is allowed on this channel pair. It is used to provide status request/reply, channel assignment requests/reply, as well as data controlling systemic features and resources of the ARCS System Architecture. It is called the **Rendezvous Channel or Channel Zero**. Mobiles transmit to *systems* on 430.5000MHz and *systems* transmit to the mobiles on 439.5000MHz. Emission designators: 11k0G2D, 11k0F2D

14.11.1 Rendezvous Channel usage details will be established and maintained by the National Council of Amateur Radio Clubs in its ARCS System Architecture specifications.

The channel numbers and their associated center frequencies:

While the channel numbering is unusual, it is rationalized below.

21 simplex only traffic-channels...

for itinerant use anywhere without coordination.

Channel One (1 439.0000 MHz) is the nationwide simplex calling frequency.

When transmitting voice traffic on these channels, sub-audible tone D is recommended.

When transmitting data traffic on these channels, sending no sub-audible tone is recommended.

14.12 Simplex frequency table:

1 439.0000, 2 438.9875, 3 438.9750, 4 438.9625, 5 438.9500, 6 438.9375, 7 438.9250, 8 438.9125, 9 438.9000, 10 438.8875, 11 438.8750, 12 438.8625, 13 438.8500, 14 438.8375, 15 438.8250, 16 438.8125, 17 438.8000, 18 438.7875, 19 438.7750, 20 438.7625, 21 438.7500.

79 duplex pairs are used for repeater channels

14.13 Repeater outputs are in the 439 MHz, upper Sub-band slice, inputs in the 430 MHz. lower slice.

The repeater input-to-output split is exactly 9 MHz.

***Itinerant repeater channels (22-29) are not coordinated;**

14.14 Itinerant repeater channels may be used anyplace for episodic events... often used by, portable “go-box repeaters.” If interference is avoided, itinerant repeater output frequencies can be use for simplex (talk-around). Simplex is not allowed on repeater inputs. Itinerant repeaters are licensed to clubs, or any amateur of Technician class or higher.

14.15 Itinerant repeaters are not required to support ***ad hoc trunking***. They will work just as current CTCSS keyed repeaters but the sub-audible tone sent by mobiles are limited to only tone: A, B or C as prescribed by the ARCS System Architecture. Tone accompanying voice on the repeater output is always tone D. Mobile using talk-around should transmit tone D.

14.16 **Itinerant Repeater Frequency Table:**

<u>22*</u> .0125,	<u>23*</u> .0250,	<u>24*</u> .0375,	<u>25*</u> .0500,
<u>26*</u> .9500,	<u>27*</u> .9625,	<u>28*</u> .9750,	<u>29*</u> .9875

14.12 Repeater using these channels require coordination from the state council and always use the ad hoc trunking prescribed by the ARCS System Architecture. They are only licensed to Amateur Radio Clubs. Simplex is not allowed on these channels.

14.17 **Coordinated Repeater Frequency Table:**

<u>30</u> .0625,	<u>31</u> .0750,	<u>32</u> .0875,	<u>33</u> .1000,	<u>34</u> .1125,
<u>35</u> .1250,	<u>36</u> .1375,	<u>37</u> .1500,	<u>38</u> .1625,	<u>39</u> .1750,
<u>40</u> .1875,	<u>41</u> .2000,	<u>42</u> .2125,	<u>43</u> .2250,	<u>44</u> .2375,
<u>45</u> .2500,	<u>46</u> .2625,	<u>47</u> .2750,	<u>48</u> .2875,	<u>49</u> .3000,
<u>50</u> .3125,	<u>51</u> .3250,	<u>52</u> .3375,	<u>53</u> .3500,	<u>54</u> .3625,
<u>55</u> .3750,	<u>56</u> .3875,	<u>57</u> .4000,	<u>58</u> .4125,	<u>59</u> .4250,
<u>60</u> .4375,	<u>61</u> .4500,	<u>62</u> .4625,	<u>63</u> .4750,	<u>64</u> .4875,
<u>65</u> .5125,	<u>66</u> .5250,	<u>67</u> .5375,	<u>68</u> .5500,	<u>69</u> .5625,
<u>70</u> .5750,	<u>71</u> .5875,	<u>72</u> .6000,	<u>73</u> .6125,	<u>74</u> .6250,
<u>75</u> .6375,	<u>76</u> .6500,	<u>77</u> .6625,	<u>78</u> .6750,	<u>79</u> .6875,
<u>80</u> .7000,	<u>81</u> .7125,	<u>82</u> .7250,	<u>83</u> .7375,	<u>84</u> .7500,
<u>85</u> .7625,	<u>86</u> .7750,	<u>87</u> .7875,	<u>88</u> .8000,	<u>89</u> .8125,
<u>90</u> .8250,	<u>91</u> .8375,	<u>92</u> .8500,	<u>93</u> .8625,	<u>94</u> .8750,
<u>95</u> .8875,	<u>96</u> .9000,	<u>97</u> .9125,	<u>98</u> .9250,	<u>99</u> .9375,

14.18 Due to their proximity to the *Rendezvous Channel*, Traffic-channels 57-72 may be preferred at sites needing very narrow pass-band duplexers.

Sub-audible CTCSS Tone Issues:

14.19 The ARCS System Architecture will prescribe four sub-audible (CTCSS) tones used when the transmitted traffic is voice. This restricted set of tone frequencies intends to facilitate easy interoperability while still using sub-audible tone to mitigate co-channel repeater interference. Moreover, this scheme avoids hearing annoying data tones when monitoring systems for voice.

14.20 Three tones (A, B and C) will be used to key repeaters when the traffic to be repeated is voice. When voice is repeated it will be accompanied by tone D regardless of which tone was used to key the repeater.

14.21 Even when voice traffic is simplex, accompanying it with tone D is recommended.

14.22 When the traffic is digital, transmitting without sub-audible tone is recommended.

(A parenthetical statement:)

Channel numbers are for human interface, mostly...

14.23 With trunking, 100 channels are adequate... then, only two-digit displays are needed (00-99). Likely, the lowest channel numbers will be preferred when operating in **manual-mode**; that is when the *Rendezvous Channel* and *ad hoc trunking* is not involved.

14.24 Often, this is simplex. So, simplex channels are the lowest numbers... 1 through 21. To be easier to remember, a world-wide simplex calling channel was chosen to be exactly at 439 MHz; it was given channel number **One (1)**. Thus, the simplex only channels step to 21 with descending frequencies.

14.25 The **Itinerant** repeater channels (22-25 & 26-29) straddle channel 0 at the edges of the duplex slots. Since they probably are at remote locations, they have less need for “tight” duplexers. Yet, they are the most likely for talk-around and **manual-mode** use. Thus, the lowest numbers 1-29 are the most likely to be selected by human interaction. While the balance of the repeaters (30-99) will be selected by **trunking-mode** controllers... where channel numbers are less important.

Related requests for rule changes:

14.26 Add this statement to the rules at: 97.1 (f) Encouragement of amateur radio support for scientific research contributed to the public domain.

14.27 Add an explicit statement at the appropriate location capturing these ideas:

Require local, state and national governments to allow reasonable property access to construct and maintain ARCS repeater systems on government controlled property... including, mountain tops, highway medians, building tops, parks, etc. This can only be withheld when there is material interference with higher priority uses. While Amateurs should be mindful of aesthetics, government must compromise some subjective aesthetic constraints to accommodate this objective public value.

14.28 Negotiate Amateur primary user status in the United States on 430-440MHz .

Respectfully submitted,

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